PATENT COOPERATION TREATY

PCT

REC'D 16 APR 2002

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

PCT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 32282-PCT	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/US99/26127	International filing date *(day/month/year)* 05 NOVEMBER 1999	Priority date *(day/month/year)* 06 NOVEMBER 1998

International Patent Classification (IPC) or national classification and IPC
Please See Supplemental Sheet.

Applicant
THE TRUSTEES OF COLUMBIA UNIVERSITY IN THE CITY OF NEW YORK

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of __7__ sheets.

☐ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority. (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of __0__ sheets.

3. This report contains indications relating to the following items:

     I   [X]   Basis of the report

     II   ☐   Priority

     III   ☐   Non-establishment of report with regard to novelty, inventive step or industrial applicability

     IV   ☐   Lack of unity of invention

     V   [X]   Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

     VI   ☐   Certain documents cited

     VII   ☐   Certain defects in the international application

     VIII   ☐   Certain observations on the international application

CORRECTED VERSION

Date of submission of the demand 05 JUNE 2000	Date of completion of this report 27 MARCH 2002

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Form PCT/IPEA/409 (cover sheet) (July 1998)*

I. Basis of the report

1. With regard to the **elements** of the international application:*

   [X] the international application as originally filed

   [X] the description:

   pages _____1-32_____ , as originally filed

   pages _____NONE_____ , filed with the demand

   pages _____NONE_____ , filed with the letter of _____

   [X] the claims:

   pages _____33-44_____ , as originally filed

   pages _____NONE_____ , as amended (together with any statement) under Article 19

   pages _____NONE_____ , filed with the demand

   pages _____NONE_____ , filed with the letter of _____

   [X] the drawings:

   pages _____1-12_____ , as originally filed

   pages _____NONE_____ , filed with the demand

   pages _____NONE_____ , filed with the letter of _____

   [X] the sequence listing part of the description:

   pages _____NONE_____ , as originally filed

   pages _____NONE_____ , filed with the demand

   pages _____NONE_____ , filed with the letter of _____

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.
   These elements were available or furnished to this Authority in the following language _____ which is:

   [ ] the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).

   [ ] the language of publication of the international application (under Rule 48.3(b)).

   [ ] the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/ or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

   [ ] contained in the international application in printed form.

   [ ] filed together with the international application in computer readable form.

   [ ] furnished subsequently to this Authority in written form.

   [ ] furnished subsequently to this Authority in computer readable form.

   [ ] The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

   [ ] The statement that the information recorded in computer readable form is identical to the writen sequence listing has been furnished.

4. [X] The amendments have resulted in the cancellation of:

   [X] the description, pages_____NONE_____

   [X] the claims, Nos. _____NONE_____

   [X] the drawings, sheets/fig _____NONE_____

5. [ ] This report has been drawn as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

   * *Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).*

   ** *Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.*

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. statement

Novelty (N)	Claims	1-64		YES
	Claims	NONE		NO
Inventive Step (IS)	Claims	NONE		YES
	Claims	1-64		NO
Industrial Applicability (IA)	Claims	1-64		YES
	Claims	NONE		NO

2. citations and explanations (Rule 70.7)

1. Claims 1-15, 20-34, 39-51, 56-61, 62/3, 62/4, 63/22, 63/23, 64/40, and 64/41 lack an inventive step under PCT Article 33(3) as being obvious over Dalziel et al (U.S. 5,579,444) in view of Nasar et al (U.S. 5,144,685).

Dalziel et al disclose a system for generating a description record from image information, comprising:

at least one image input interface for receiving said image information (Figure 2, Camera 12); a computer processor coupled to said at least one image input interface for receiving said image information therefrom, processing said image information by performing image object extraction processing to generate image object descriptions from said image information, processing said generated image object descriptions by object hierarchy construction and extraction processing to generate image object hierarchy descriptions (Figure 4; Column 12, Lines 1-25), and processing said generated image object descriptions by entity relation generation processing to generate entity relation descriptions, wherein at least one description record including said image object descriptions, said image object hierarchy descriptions and said entity relation descriptions is generated to represent content embedded within said image information (Figures 23 and 24; Column 39, Lines 64-67, Column 40, Lines 1-49. Object hierarchy description includes identifying oranges and apples, and color of the objects, i.e., red apples and green apples. Entity relation description identifies the relative position of the objects, i.e., object 1 is be;ow object 2.); and a data storage system, operatively coupled to said processor, for storing said at least one description record. Dalziel et al do not explicitly disclose generating entity relation graph descriptions for the identified objects. Nasar et al disclose a landmark recognition system compriisng generating entity relation graph descriptions (Figure 10; Column , Lines . The entity relation graph depicts positional relationship between the gate and the road in the landmark image of Figure 13.).
It would have been obvious to a person of ordinary skil in the art at the time the invention was made to modify Dalziel et al
(Continued on Supplemental Sheet.)

Form PCT/IPEA/409 (Box V) (July 1998)*

Supplemental Box
(To be used when the space in any of the preceding boxes is not sufficient.)

Continuation of: Boxes I - VIII

Sheet 10

CLASSIFICATION:
        The International Patent Classification (IPC) and/or the National classification are as listed below:
IPC(7): and US Cl.: G06K 9/00, 9/34, 9/46, 9/56, 9/36, 9/60; G06F 3/00; G09C 5/00; H04N 7/12; G06F 7/00, 15/00;
AND
US CL.: 382/164, 165, 173, 181, 190, 195, 205, 232, 237, 304; 707/1, 3, 104, 514; 345/114, 328; 348/408; 706/55

V. 2. REASONED STATEMENTS - CITATIONS AND EXPLANATIONS (Continued):
invention according to the teachings of Nasar et al to generate entity relation graph descriptions for the identified objects
because the symbolic characterization of the features using relative image information (image entity relation graph) will
provide a better abstraction of the image and a framework for knowledge-based reasoning (Nasar et al; Column 8, Lines
10-13).

        Regarding Claim 2, Dalziel et al further disclose the system of claim 1, wherein said image object extraction
processing and said object hierarchy construction and extraction processing are performed in parallel (Figure 4, Task parallel
Processing; Column 12, Lines 5-19).

        Regarding Claim 3, Dalziel et al further disclose the system of claim 1, wherein said image object extraction
processing comprises: image segmentation processing to segment each image in said image inforination into regions within said
image (Figure 2, Image Segmenter 14); and feature extraction and annotation processing to generate one or more feature
descriptions for one or
more said regions (Figure 2, Tracker, Sketcher, ranger 16a-16c, Reeognizer 18; Column 10, Lines 58-67, Column 11, Lines1-
6); whereby said generated image object descriptions comprise said one or more feature descriptions for one or more said
regions (Figure 16; Column 30, Lines 15-41).

        Regarding Claim 4, Dalziel et al further disclose the system of claim 3, wherein said ⌐ne or more feature
descriptions are selected from the group consisting of media features, visual features, and semantic features (Column 30, Lines
15-41. Feature descriptor green is selected from visual features of the object.).

        Regarding Claim 5, Dalziel et al further disclose the system of claim 4, wherein said semantic features are further
defined by at least one feature description selected fre-a the group consisting of who, what object, what action, where, when,
why, code downloading, and text annotation (Figure 24; Column 40, Lines 5-8. The semantic feature for Object 1 is "what
object".).

        Regarding Claim 6, Dalziel et al further disclose the system of claim 4, wherein said visual features are further
defined by at least one feature description selected from the group consisting of color, texture, position, size, shape, motion,
code downloading, and orientation (Figure 24; Column 40, Lines 38-48. The visual feature for Objects 2 and 3 is "position".
Object 2 is apart from Object 1 at points c and d.).

        Regarding Claim 7, Dalziel et al further disclose the system of claim 4, wherein said said media features are further
defined by at least one feature description selected from the group consisting of file format, file size, color representation,
resolution, data file location, author, creation, scalable layer, code downloading, and modality transcoding (Figure 16; Column
30, Lines 29-38. The media feature for Region A is "green".).

        Regarding Claim 8, Dalziel et al further disclose the system of claim 1, wherein said object hierarchy construction
and extraction processing generates image object hierarchy descriptions of said image object descriptions based on visual
feature relationships of image objects represented by said image object descriptions (Figure 24; Column 40, Lines 38-48. The
visual feature for Objects 2 and 3 is "position". Object 2 is apart from Object 1 at points c and d.).

        Regarding Claim 9, Dalziel et al further disclose the system of claim 1, wherein said object hierarchy construction
and extraction processing generates image object bier: chy descriptions of said image object descriptions based on semantic
feature relationships of image objects represented by said image object descriptions (Figure 24; Column 40, Lines 5-8. The
semantic feature for Object 1 is "what object".).

        Regarding Claim 10, Dalziel et al further di.close the system of claim 1, wherein said object hierarchy construction
and extraction processing generates image object hierarchy descriptions of said image object descriptions based on media
feature relationships of image objects represented by said image object descriptions (Figure 16; Column 30, Lines 29-38. The

Supplemental Box
(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: Boxes I - VIII

Sheet 11

media feature for Region A is "green".).

Regarding Claim 11, arguments analogous to those presented for Claims 8-10 are applicable to Claim 11.

Regarding Claim 12, Dalziel et al further disclose the system of claim 1, wherein said object hierarchy construction and extraction processing generates image object hierarchy descriptions of said image object descriptions based on relationships of image objects represented by said image object descriptions, wherein said image object hierarchy descriptions have a plurality of hierarchical levels (Figures 24 and 26; Column 40, Lines 28-49).

Regarding Claim 13, Dalziel et al further disclose the system of claim 12, wherein said image object hierarchy descriptions having a plurality of hierarchical levels comprise clustering hierarchies (Figure 26; Column 42, Lines 28-43).

Regarding Claim 14, arguments analogous to those presented for Claims 8-10 are applicable to Claim 14.

Regarding Claim 15, Nasar et al further disclose the system of claim 1, wherein said entity relation graph generation processing generates entity relation graph descriptions of said image object descriptions based on relationships of image objects represented by said image object descriptions, wherein said relationships are selected from the group consisting of visual feature relationships, semantic feature relationships and media feature relationships (Figure 10; Column 8, Lines 50-68).

With regards to Claims 20 and 39, arguments analogous to those presented for Claim 1 are applicable to Claims 20 and 39.

With regards to Claims 21 and 40, arguments analogous to those presented for Claim 2 are applicable to Claims 21 and 40.

With regards to Claim 22, arguments analogous to those presented for Claim 3 are applicable to Claim 22.

With regards to Claims 23 and 41, arguments analogous to those presented for Claim 4 are applicable to Claims 23 and 41.

With regards to Claims 24 and 42, arguments analogous to those presented for Claim 5 are applicable to Claims 24 and 42.

With regards to Claims 25 and 43, arguments analogous to those presented for Claim 6 are applicable to Claims 25 and 43.

With regards to Claims 26 and 44, arguments analogous to those presented for Claim 7 are applicable to Claims 26 and 44.

With regards to Claims 27 and 45, arguments analogous to those presented for Claim 8 are applicable to Claims 27 and 45.

With regards to Claims 28 and 46, arguments analogous to those present⊾ ' for Claim 9 are applicable to Claims 28 and 46.

With regards to Claims 29 and 47, arguments analogous to those presented for Claim 10 are applicable to Claims 29 and 47.

With regards to Claim 30, arguments analoi)us to those presented for Claim 11 are applicable to Claim 30.

With regards to Claims 31 and 48, arguments analogous to those presented for Claim 12 are applicable to Claims 31 and 48.

With regards to Claims 32 and 49, arguments analogous to those presented for Claim 13 are applicable to Claims 32 and 49.

With regards to Claims 33 and 50, arguments analogous to those presented for Claim 14 are applicable to Claims 33 and 50.

Supplemental Box
(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: Boxes I - VIII   Sheet 12

With regards to Claims 34 and 51, arguments analogous to those presented for Claim 15 are applicable to Claims 34 and 51.

Regarding Claim 56, Dalziel et al further disclose the system of Claim 12, wherein said image object hierarchy descriptions having a plurality of hierarchical levels are configured to comprise multiple levels of abstraction hierarchies (Figure 26; Column 42, Lines 28-43).

With regards to Claims 57, 59 and 61, arguments analogous to those presented for Claim 11 are applicable to Claims 57, 59 and 61.

With regards to Claims 58 and 60, arguments analogous to those presented for Claim 56 are applicable to Claims 58 and 60.

Regarding Claims 62/3 and 62/4, Nasar et al further disclose a landmark recognition system wherein one or more feature descriptions include pointers to extraction and matching code in order to facilitate code downloading (Figure 2; Column 6, Lines 3-14).

With regards to Claims 63/22 and 63/23, arguments analogous to those presented for Claims 62/3 and 62/4 are applicable to Claims 63/22 and 63/23.

With regards to Claims 64/40 and 64/41, arguments analogous to those presented for Claim 62/3 and 62/4 are applicable Claims 4/40 an 64/41.

2. Claims 16-19, 35-38 and 52-55 lack an inventive step under PCT Article 3(3) as beinng obvious over Dalziel et al (U.S. 5,579,444) further in view of Nasar et al (U.S. 5,144, 85) and Tuong Dao (An Indexing Model for Structur Documents to Support Queries on Content, Structure and Attributes, IEEE Paper ISBN: 0-8186-8464-X).

Regarding Claim 16, neither Dalziel et al nor Nasar et al disclose the system of claim 1, further comprising an encoder for receiving and encoding said image object descriptions into encoded description information. Tuong Dao disclose an indexing model for structured documents comprising an encoder for receiving and encoding document descriptions into encoded description information (Page 92, Section 2.2.3), wherein said data storage system is operative to store said encoded description information as said at least one description record (Page 93, Section 3.1). It would have been obvious to a person of ordinary skil in the art at the time the invention was made to modify Dalziel et al and Nasar et al combination according to the teachings of Tuong Dao to include an encoder for receiving and encoding the image object descriptions into encoded description information because it will expedite retrieving the desired documents and will implement the process more securely.

Regarding Claim 17, arguments analogous to those presented for Claims 11 and 16 are applicable to Claim 17.

Regarding Claim 18, neither of Dalziel et al, Nasar et al and Tuong Dao disclose the system of claim 17, wherein said encoder comprises a binary encoder. Utilization of binary encoders are extremely well known in the art. It would have been obvious to a person of ordinary skil in the art at the time the invention was made to use a binary encoder for receiving and encoding the image object descriptions into encoded description information because it is the simplest and most convetional encoder routinely implemented in the art.

Regarding Claim 19, Tuong Dao further disclose the system of claim 17, wherein said encoder comprises an XML encoder (Page 88, Column 1, Lines 1-3).

With regards to Claims 35 and 52, arguments analogous to those presented for Claim 16 are applicable to Claims 35 and 52.

With regards to Claims 36 and 53, arguments analogous to those presented for Claim 17 are applicable to Claims 36 and 53.

With regards to Claims 37 and 54, arguments analogous to those presented for Claim 18 are applicable to Claims 37 and 54.

Supplemental Box
(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: Boxes I - VIII   Sheet 13

With regards to Claims 38 and 55, arguments analogous to those presented for Claim 19 are applicable to Claims 38 and 55.

With regards to Claims 58 and 60, arguments analogous to those presented for Claim 56 are applicable to Claims 58 and 60.

With regards to Claims 59 and 61, arguments analogous to those presented for Claim 57 are applicable to Claims 59 and 61.

Applicants' response filed May 7, 2001 have been fully considered but they are not persuasive.

Dalziel et al clearly disclose generating image object descriptions and image object hierarchy description from the image information as depicted in Figures 4, 22-24 and disclosed in Column 12, Lines 1-25; Column 39, Lines 64-67, Column 40,Lines 1-49. Based on the processed image information, type of the objects in the image (i.e., apple, orange and bowl) and the hierarchical information concerning relative location of the objects in the image have been disclosed.

As it was previously stated, Dalziel et al do not explicitly disclose generating entity relation graph descriptions for the identified objects. Nasar et al disclose a landmark recognition system compriisng generating entity relation graph descriptions (Figure 10; Column , Lines . The entity relation graph depicts positional relationship between the gate and the road in the landmark image of Figure 13.).

Combined teachings of Dalziel et al and Nassar et al disclose claimed invention cited in independent Claims because the symbolic characterization of the features using relative image information (image entity relation graph) will provide a better abstraction of the image and a framework for knowledge-based reasoning (Nasar et al; Column 8, Lines 10-13).

-------------------- NEW CITATIONS --------------------
NONE